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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to a projection type display.

[0002]

[Description of the Prior Art]Image lights are compounded using a liquid crystal device etc. as a light modulation device, and the projection type display which carries out extended projection of the compounded image lights to a screen via the projection optical system which consists of projector lenses etc. is known. The structure of the conventional projection type display is explained based on drawing 6. In drawing 6, a reflective mirror, and 822, 823 and 824 show a light modulation device, 825 shows a dichroic prism, and, as for a dichroic mirror, and 815, 816 and 817, the light source in which 810 consists of lamps, such as metal halide, and 813 and 814 show a projection optical system 826.

[0003]While the dichroic mirror 813 penetrates red light, it has the character to reflect blue glow and green light, and it is reflected by the reflective mirror 817 and the red light which penetrated the dichroic mirror 813 among the lights emitted from the light source 810 enters into the light modulation device 822 for red light. On the other hand, among the colored light reflected with the dichroic mirror 813, green light, It is reflected by the dichroic mirror 814 which reflects green light, and enters into the light modulation device 823 for green light, and blue glow also penetrates the dichroic mirror 814, and after being reflected by the reflective mirrors 815 and 816, it enters into the light modulation device 824 for blue glow. Three colored light modulated by each light modulation device enters into the dichroic prism 825, three colored light is compounded, and the light showing a color picture is formed. It is projected on the compounded light on the screen 827 by the projection optical system 826, and it has the structure where a picture is expanded and displayed.

[0004]

[Problem(s) to be Solved by the Invention]In the above-mentioned conventional projection type display, the spectrum of the light emitted from the light source is carried out to three colored light using a dichroic mirror, Since a means to compound three colored light and to form one image lights with a dichroic prism again was adopted after becoming irregular with three light modulation devices different, respectively, many optics were required and it was difficult to attain a miniaturization. Since the light modulation device is directly irradiated after carrying out the spectrum of the light emitted from a light source in the conventional projection type display, using lamps, such as metal halide, as a light source, Depending on the emission spectrum of a lamp, while color saturation control is difficult for the luminosity for every colored light, An irregular color and luminosity unevenness arise in the picture which it originates in the luminescence unevenness of a light source, and luminosity unevenness occurs within the light flux of each colored light, becomes uneven [the illumination of the colored light irradiated by the light modulation device], and is displayed on a screen as a result, and there is a possibility that display quality may deteriorate.

[0005]Then, this invention was made in light of the above-mentioned circumstances, and equalizes the illumination of the colored light irradiated by the light modulation device while being able to attain the miniaturization of a device, and it aims at providing the projection type display which was excellent in display quality.

[0006]

[Means for Solving the Problem]Two or more light sources with possible a projection type display of this invention emitting different colored light, respectively, One illumination equalization means for equalizing illumination of each colored light emitted from said two or more light sources, While providing a light guide means to lead each colored light emitted by said two or more light sources to said illumination equalization means, and one light modulation device which modulates each colored light by which illumination was equalized by said illumination equalization means, An optical outgoing radiation control means with possible controlling timing which emits colored light from

each light source, and making colored light emit one by one time from said two or more light sources, A light modulation device driving means which makes it correspond to colored light emitted from each light source and as for which time drives said light modulation device one by one, A synchronized signal which synchronizes timing which emits colored light from each light source, and timing which drives said light modulation device is generated, and a synchronizing signal generating means inputted into said optical outgoing radiation control means and said light modulation device driving means is provided.

[0007]Namely, each colored light emitted by two or more light sources using two or more light sources which can emit colored light which is different in this invention, respectively by a light guide means. After leading to one illumination equalization means and equalizing illumination of each colored light by the same illumination equalization means, it has composition which displays by modulating each colored light by which illumination was equalized with one light modulation device. Thus, since it has composition which equalizes illumination of each colored light emitted by two or more light sources by one illumination equalization means in this invention, While color adjustment becomes can set up luminosity of two or more colored light independently respectively, and easy, Luminance distribution within light flux of each colored light can be equalized, an irregular color and luminosity unevenness can be prevented from arising in a picture displayed on a screen, and a projection type display which was excellent in display quality can be provided.

[0008]An optical outgoing radiation control means with possible controlling timing which emits colored light from each light source by this invention, and making colored light emit one by one time from two or more light sources, A light modulation device driving means which makes it correspond to colored light emitted from each light source and as for which time drives a light modulation device one by one, It has composition possessing a synchronizing signal generating means which outputs a synchronized signal which synchronizes timing which emits colored light from each light source, and timing which drives a light modulation device to an optical outgoing radiation control means and a light modulation device driving means.

[0009]Namely, by synchronizing timing which carries out the time sharing of the one frame, makes colored light emit one by one time from two or more light sources in this invention, and emits colored light from each light source, and timing which drives a light modulation device, It is made to correspond to colored light emitted from each light source, time drives a light modulation device one by one, and it has composition which compounds a color picture by outputting a picture signal corresponding to colored light emitted from each light source. Thus, since it is not necessary to display by forming a pixel for every color by adopting the color order following drive system as a drive system of a light modulation device, highly minute-ization of a light modulation device can be attained, and a projection type display which was excellent in display quality can be provided.

[0010]After carrying out the spectrum of the light emitted from this light source to two or more colored light using one light source conventionally, To having become irregular with two or more light modulation devices, having compounded colored light of after that plurality again, and having displayed a picture, in this invention. Since a light modulation device with which a means which carries out a spectrum, and a means to re-compound two or more colored light are unnecessary to two or more colored light, and were conventionally formed in it can be made into one piece, an optic to be used can be lessened and a miniaturization of a device can be attained.

[two or more]

[0011]In a projection type display of this invention, as said illumination equalization means, a rod lens or a fly eye lens of a couple can specifically be illustrated, and a dichroic prism can specifically be illustrated as said light guide means. Specifically as colored light emitted by said two or more light sources, red light, green light, and blue glow can be illustrated.

[0012]

[Embodiment of the Invention]Next, the embodiment concerning this invention is explained in full detail. Based on drawing 1 – drawing 5, the structure of the projection type display of the embodiment concerning this invention is explained. The schematic diagram in which drawing 1 shows the entire structure of the projection type display 10 of this embodiment, the outline perspective view in which drawing 2 shows the example of 1 composition of the light source with which the projection type display 10 was equipped, and which is mentioned later, The outline perspective view and outline sectional view showing the structure of the rod lens (illumination equalization means) mentioned later where the projection type display 10 was equipped with drawing 3 (a) and (b), The figure and drawing 5 in which the example of others of an illumination equalization means by which the projection type display 10 is equipped with drawing 4 is shown are a figure showing the relation between the timing which emits colored light, and the timing which drives a light modulation device from the light source in the projection type display 10 of this embodiment. The projection type display of this embodiment is an example, and this invention is not limited to this.

[0013]As shown in drawing 1, the projection type display 10 of this embodiment, The light sources 20R, 20G, and 20B which can emit red light (R), green light (G), and blue glow (B), respectively, The rod lens (illumination

equalization means) 30 for equalizing the illumination of each colored light emitted from each light sources 20R, 20G, and 20B, The light modulation device 40 which modulates each colored light by which illumination was equalized with the rod lens 30, and combines a picture, The projection optical system 50 for carrying out extended projection of the picture combined by the light modulation device 40 and the screen 60 which displays the picture expanded by the projection optical system 50 are constituted as a subject.

[0014]Each light sources 20R, 20G, and 20B comprise light emitting devices, such as a light emitting diode which can emit light, respectively, and electroluminescence, in red light, green light, and blue glow, Each light sources 20R, 20G, and 20B may comprise one light emitting device respectively, and two or more light emitting devices may be arranged by array form as shown, for example in drawing 2. In drawing 2, the numerals 2 show each light emitting device. Thus, as compared with the case where lamps, such as metal halide, are used as a light source, the life of a light source can be lengthened like before by constituting each light sources 20R, 20G, and 20B by one piece or two or more light emitting devices. Since the arrangement of a light emitting device, etc. can be freely designed for every light source by arranging independently each light sources 20R, 20G, and 20B, the luminosity of each colored light emitted from each light source can be adjusted freely.

[0015]Each light sources 20R, 20G, and 20B are connected to the optical outgoing radiation control circuit (optical outgoing radiation control means) 70, and by this optical outgoing radiation control circuit 70. The timing which emits colored light from each light sources 20R, 20G, and 20B is controlled, and it has structure with possible making colored light emit one by one time from the light sources 20R, 20G, and 20B.

[0016]The colored light emitted from each light sources 20R, 20G, and 20B is led to the rod lens 30 by the light guide means 22, after being condensed with the lenses 21R, 21G, and 21B formed corresponding to each light source. The dielectric multilayer by which four rectangular prisms are stuck and the light guide means 22 reflects red light in the inner surface, for example, and the dielectric multilayer which reflects blue glow consist of a cross dichroic prism formed in cross shape, Each colored light which entered from three different directions (graphic display above, the graphic display left, graphic display down) has structure led to the rod lens 30 altogether located in the method of the graphic display right by the light guide means 22.

[0017]As the rod lens 30 is shown in drawing 3 (a), the shape is rectangular parallelepiped shape, the graphic display left end of the rod lens 30 becomes the light incidence face 31, and the graphic display right end has become the light emitting surface 32. As shown in drawing 3 (b), in the rod lens 30, the light which entered into the light incidence face 31 from various directions goes straight on, or has on the side 1 time or structure which multiple-times total internal reflection is carried out, and is emitted from the light emitting surface 32. And regardless of the density distribution of the light which enters into the rod lens 30, it has structure which can emit light by uniform density distribution from the whole surface of the light emitting surface 32, and can, as a result, equalize the illumination (luminance distribution) of light. As shown in drawing 1, when the light guide means 22 consists of cross dichroic prisms, all the colored light emitted from the light guide means 22 can be led to the rod lens 30 by making the light incidence face 31 of the rod lens 30 join the light emitting surface of the light guide means 22.

[0018]As an illumination equalization means, as shown in drawing 4 other than the rod lens 30, the fly eye lenses 35 and 36 of the couple by which the placed opposite was carried out can also constitute from a prescribed interval. By arranging the fly eye lenses 35 and 36 of a couple in which many convex lenses were allocated on the surface of one side so that a convex lens may counter mutually as shown in drawing 4, After being condensed with each convex lens of the fly eye lens 35 on the left-hand side of a graphic display, the colored light emitted from the light guide means 22 is diffused with each convex lens of the fly eye lens 36 on the right-hand side of a graphic display, and is emitted. Thus, the illumination of colored light can be equalized by passing the fly eye lenses 35 and 36 of a couple by piling up the light which passed each convex lens on a light modulation device.

[0019]It is condensed via the lenses 37 and 38 and each colored light emitted in the various directions with uniform illumination from the rod lens 30 (fly eye lenses 35 and 36) is irradiated by the light modulation device 40 which consists of liquid crystal devices etc. In drawing 1, although illustrated about the case where the transmission type light modulation device 40 is used, this invention is not limited to this and may use a reflection type light modulation device. The light modulation device 40 is connected to the light modulation device drive circuit (light modulation device driving means) 80, and it has structure as for which it is made to correspond to each colored light by this light modulation device drive circuit 80, and time can drive the light modulation device 40 one by one.

[0020]In this embodiment, have the synchronizing signal generation circuit (synchronizing signal generating means) 90, and by this synchronizing signal generation circuit 90. It has the structure where the timing which emits colored light, and the timing which drives the light modulation device 40 can be synchronized from each light sources 20R, 20G, and 20B by generating the synchronized signal SYNC and inputting into the optical outgoing radiation control circuit 70 and the light modulation device drive circuit 80.

[0021]Namely, in the projection type display 10 of this embodiment. Carry out the time sharing of the one frame, and one by one time from the light sources 20R, 20G, and 20B Red light, By synchronizing the timing which makes green light and blue glow emit and emits colored light from each light sources 20R, 20G, and 20B, and the timing which drives the light modulation device 40, It is made to correspond to the colored light emitted from each light sources 20R, 20G, and 20B, time drives the light modulation device 40 one by one, and it has structure which can compound a color picture by outputting the picture signal corresponding to the colored light emitted from each light sources 20R, 20G, and 20B.

[0022]This is explained based on drawing 5. As shown in drawing 5, carry out the time sharing of the one frame to three, and The light sources 20R and 20G, The light modulation device 40 is driven according to the outgoing radiation timing of the light which makes emit red light, blue glow, and green light one by one from 20B, and is emitted from the light sources 20R, 20G, and 20B, and the picture signal corresponding to the colored light emitted is outputted. While red light (R) is emitted by the light source 20R, specifically, picture signal SR corresponding to red light (R) is outputted by the light modulation device 40. While green light (G) or blue glow (B) is similarly emitted by the light source 20G or 20B about green light and blue glow, the picture signal SG or picture signal SB corresponding to green light (G) or blue glow (B) is outputted by the light modulation device 40. And it is possible for every frame to compound a color picture based on the picture signals SR, SG, and SB corresponding to red light, green light, and blue glow. Although the case where colored light was made to emit was explained in order of red light, green light, and blue glow, this invention is not limited to this and may make colored light emit to what kind of order in drawing 5.

[0023]Thus, since it is not necessary to display by forming a pixel for every color by adopting the color order following drive system as a drive system of the light modulation device 40 according to this embodiment, highly minute-ization of the light modulation device 40 can be attained, and the projection type display 10 which was excellent in display quality can be provided. Extended projection of the color picture compounded by the light modulation device 40 is carried out to the screen 60 via the projection optical system 50 which consists of projector lenses etc., and a display is performed.

[0024]Since it has composition which equalizes the illumination (luminance distribution) of each colored light emitted by two or more light sources 20R, 20G, and 20B by one illumination equalization means (the rod lens 30 or the fly eye lenses 35 and 36) according to this embodiment, While being able to set up the luminosity for every colored light independently, the luminance distribution within the light flux of each colored light can be equalized, an irregular color and luminosity unevenness can be prevented from arising in the picture displayed on the screen 60, and the projection type display 10 which was excellent in display quality can be provided.

[0025]According to this embodiment, to having become irregular with two or more light modulation devices, having compounded the colored light of after that plurality again, and having displayed the picture conventionally, after carrying out the spectrum of the light emitted from this light source to two or more colored light using one light source. Since the light modulation device with which the means which carries out a spectrum, and a means to re-compound two or more colored light are unnecessary to two or more colored light, and were conventionally formed in it can be made into one piece, the optic to be used can be lessened and the miniaturization of a device can be attained. [two or more]

[0026]

[Effect of the Invention]As mentioned above, two or more light sources which can emit different colored light, respectively according to this invention as explained in detail, One illumination equalization means for equalizing the illumination of each colored light emitted from two or more light sources, By having composition which forms a light guide means to lead each colored light emitted by the light source to an illumination equalization means, and one light modulation device which modulates each colored light by which illumination was equalized by the illumination equalization means, While being able to equalize the luminosity for every colored light, the luminance distribution within the light flux of each colored light can be equalized, an irregular color and luminosity unevenness can be prevented from arising in the picture displayed on a screen, and the projection type display which was excellent in display quality can be provided.

[0027]Since the composition which displays by making it correspond to the colored light which makes emit colored light one by one time from two or more light sources, and is emitted from each light source, and time driving a light modulation device one by one is adopted according to this invention, Since the light modulation device with which the means which carries out a spectrum, and a means to re-compound two or more colored light are unnecessary to two or more colored light, and were conventionally formed in it can be made into one piece, the optic to be used can be lessened and the miniaturization of a device can be attained. [two or more]

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TECHNICAL FIELD

[Field of the Invention]This invention relates to a projection type display.

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PRIOR ART

[Description of the Prior Art]Image lights are compounded using a liquid crystal device etc. as a light modulation device, and the projection type display which carries out extended projection of the compounded image lights to a screen via the projection optical system which consists of projector lenses etc. is known. The structure of the conventional projection type display is explained based on drawing 6. In drawing 6, a reflective mirror, and 822, 823 and 824 show a light modulation device, 825 shows a dichroic prism, and, as for a dichroic mirror, and 815, 816 and 817, the light source in which 810 consists of lamps, such as metal halide, and 813 and 814 show a projection optical system 826.

[0003]While the dichroic mirror 813 penetrates red light, it has the character to reflect blue glow and green light, and it is reflected by the reflective mirror 817 and the red light which penetrated the dichroic mirror 813 among the lights emitted from the light source 810 enters into the light modulation device 822 for red light. On the other hand, among the colored light reflected with the dichroic mirror 813, green light, It is reflected by the dichroic mirror 814 which reflects green light, and enters into the light modulation device 823 for green light, and blue glow also penetrates the dichroic mirror 814, and after being reflected by the reflective mirrors 815 and 816, it enters into the light modulation device 824 for blue glow. Three colored light modulated by each light modulation device enters into the dichroic prism 825, three colored light is compounded, and the light showing a color picture is formed. It is projected on the compounded light on the screen 827 by the projection optical system 826, and it has the structure where a picture is expanded and displayed.

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EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, two or more light sources which can emit different colored light in this invention, respectively as explained in detail, It has composition which forms one illumination equalization means for equalizing the illumination of each colored light emitted from two or more light sources, a light guide means to lead each colored light emitted by the light source to an illumination equalization means, and one light modulation device that modulates each colored light by which illumination was equalized by the illumination equalization means.

Therefore, while being able to equalize the luminosity for every colored light, the luminance distribution within the light flux of each colored light can be equalized, an irregular color and luminosity unevenness can be prevented from arising in the picture displayed on a screen, and the projection type display which was excellent in display quality can be provided.

[0027]In this invention, it was made to correspond to the colored light which makes emit colored light one by one time from two or more light sources, and is emitted from each light source, time drove the light modulation device one by one, and the composition which displays is adopted.

Therefore, since the light modulation device with which the means which carries out a spectrum, and a means to re-compound two or more colored light are unnecessary to two or more colored light, and were conventionally formed in it can be made into one piece, the optic to be used can be lessened and the miniaturization of a device can be attained. [two or more]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]In the above-mentioned conventional projection type display, the spectrum of the light emitted from the light source is carried out to three colored light using a dichroic mirror, Since a means to compound three colored light and to form one image lights with a dichroic prism again was adopted after becoming irregular with three light modulation devices different, respectively, many optics were required and it was difficult to attain a miniaturization. Since the light modulation device is directly irradiated after carrying out the spectrum of the light emitted from a light source in the conventional projection type display, using lamps, such as metal halide, as a light source, Depending on the emission spectrum of a lamp, while color saturation control is difficult for the luminosity for every colored light, An irregular color and luminosity unevenness arise in the picture which it originates in the luminescence unevenness of a light source, and luminosity unevenness occurs within the light flux of each colored light, becomes uneven [the illumination of the colored light irradiated by the light modulation device], and is displayed on a screen as a result, and there is a possibility that display quality may deteriorate.

[0005]Then, this invention was made in light of the above-mentioned circumstances, and equalizes the illumination of the colored light irradiated by the light modulation device while being able to attain the miniaturization of a device, and it aims at providing the projection type display which was excellent in display quality.

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MEANS

[Means for Solving the Problem]Two or more light sources with possible a projection type display of this invention emitting different colored light, respectively, One illumination equalization means for equalizing illumination of each colored light emitted from said two or more light sources, While providing a light guide means to lead each colored light emitted by said two or more light sources to said illumination equalization means, and one light modulation device which modulates each colored light by which illumination was equalized by said illumination equalization means, An optical outgoing radiation control means with possible controlling timing which emits colored light from each light source, and making colored light emit one by one time from said two or more light sources, A light modulation device driving means which makes it correspond to colored light emitted from each light source and as for which time drives said light modulation device one by one, A synchronized signal which synchronizes timing which emits colored light from each light source, and timing which drives said light modulation device is generated, and a synchronizing signal generating means inputted into said optical outgoing radiation control means and said light modulation device driving means is provided.

[0007]Namely, each colored light emitted by two or more light sources using two or more light sources which can emit colored light which is different in this invention, respectively by a light guide means. After leading to one illumination equalization means and equalizing illumination of each colored light by the same illumination equalization means, it has composition which displays by modulating each colored light by which illumination was equalized with one light modulation device. Thus, since it has composition which equalizes illumination of each colored light emitted by two or more light sources by one illumination equalization means in this invention, While color adjustment becomes can set up luminosity of two or more colored light independently respectively, and easy, Luminance distribution within light flux of each colored light can be equalized, an irregular color and luminosity unevenness can be prevented from arising in a picture displayed on a screen, and a projection type display which was excellent in display quality can be provided.

[0008]An optical outgoing radiation control means with possible controlling timing which emits colored light from each light source by this invention, and making colored light emit one by one time from two or more light sources, A light modulation device driving means which makes it correspond to colored light emitted from each light source and as for which time drives a light modulation device one by one, It has composition possessing a synchronizing signal generating means which outputs a synchronized signal which synchronizes timing which emits colored light from each light source, and timing which drives a light modulation device to an optical outgoing radiation control means and a light modulation device driving means.

[0009]Namely, by synchronizing timing which carries out the time sharing of the one frame, makes colored light emit one by one time from two or more light sources in this invention, and emits colored light from each light source, and timing which drives a light modulation device, It is made to correspond to colored light emitted from each light source, time drives a light modulation device one by one, and it has composition which compounds a color picture by outputting a picture signal corresponding to colored light emitted from each light source. Thus, since it is not necessary to display by forming a pixel for every color by adopting the color order following drive system as a drive system of a light modulation device, highly minute-ization of a light modulation device can be attained, and a projection type display which was excellent in display quality can be provided.

[0010]After carrying out the spectrum of the light emitted from this light source to two or more colored light using one light source conventionally, To having become irregular with two or more light modulation devices, having compounded colored light of after that plurality again, and having displayed a picture, in this invention. Since a light modulation device with which a means which carries out a spectrum, and a means to re-compound two or more colored light are unnecessary to two or more colored light, and were conventionally formed in it can be made into one piece, an optic to be used can be lessened and a miniaturization of a device can be attained.
[two or more]

[0011]In a projection type display of this invention, as said illumination equalization means, a rod lens or a fly eye

lens of a couple can specifically be illustrated, and a dichroic prism can specifically be illustrated as said light guide means. Specifically as colored light emitted by said two or more light sources, red light, green light, and blue glow can be illustrated.

[0012]

[Embodiment of the Invention]Next, the embodiment concerning this invention is explained in full detail. Based on drawing 1 – drawing 5, the structure of the projection type display of the embodiment concerning this invention is explained. The rod lens in which the projection type display 10 was equipped with the schematic diagram in which drawing 1 shows the entire structure of the projection type display 10 of this embodiment, the outline perspective view showing the example of 1 composition of the light source in which the projection type display 10 was equipped with drawing 2, and which is mentioned later, and drawing 3 (a) and (b) and which is mentioned later

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Drawing 1 is a schematic diagram showing the entire structure of the projection type display of the embodiment concerning this invention.

[Drawing 2] Drawing 2 is an outline perspective view showing the example of 1 composition of the light source with which the projection type display of the embodiment concerning this invention was equipped.

[Drawing 3] Drawing 3 (a) and (b) is the outline perspective view and outline sectional view showing the structure of the rod lens (illumination equalization means) with which the projection type display of the embodiment concerning this invention was equipped.

[Drawing 4] Drawing 4 is a figure showing the example of others of the illumination equalization means with which the projection type display of the embodiment concerning this invention is equipped.

[Drawing 5] Drawing 5 is a figure showing the relation between the timing in the projection type display of the embodiment concerning this invention which emits colored light from a light source, and the timing which drives a light modulation device.

[Drawing 6] Drawing 6 is an outline sectional view showing the structure of the conventional projection type display.

[Description of Notations]

10 Projection type display

20R, 20G, and 20B Light source

22 Light guide means

30 Rod lens (illumination equalization means)

35 and 36 Fly eye lens (illumination equalization means)

40 Light modulation device

50 Projection optical system

60 Screen

70 Optical outgoing radiation control circuit (optical outgoing radiation control means)

80 Light modulation device drive circuit (light modulation device driving means)

90 Synchronizing signal generation circuit (synchronizing signal generating means)

[Translation done.]